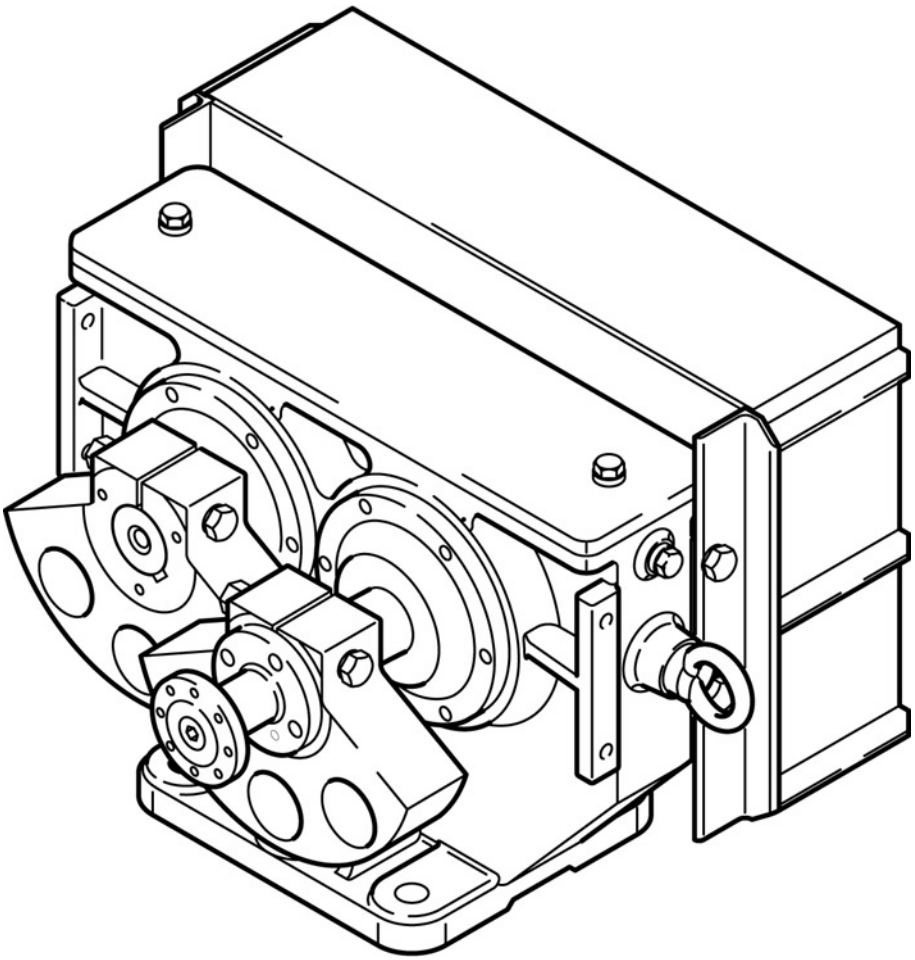
Assembly and operating instructions

Unbalance exciter

Issue 11.07



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SCHWINGTECHNIK GmbH

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1. Notes on using these technical instructions

Please read the following pages in order to improve your understanding and utilization of these technical instructions.

Always observe the following rules:
These technical instructions must be read prior to use, assembly or taking into operation. General and local health and safety regulations must also be observed.

1.1 Who needs to be familiar with these technical instructions

All persons in whose area the oscillating machine and the unbalance exciter are set up must be familiar with these technical instructions.

Users must also be conversant with these operating instructions.

The electrician must be aware of the specifications on electrical instructions.

Service personnel must know the maintenance and repair instructions.

The following generally applies:
Any person working on the unbalance exciter must be familiar with the contents of these technical instructions. Personnel must be qualified and given proper instructions. The operator is obliged to instruct his personnel accordingly.

1.2 Points for special considerations

Please ensure that these technical instructions ...

- may generally not be separated or altered. Only FRIEDRICH Schwingtechnik GmbH may amend the instructions.
- must be maintained complete in vicinity of the oscillating machine; missing pages or complete technical instructions can be requested from FRIEDRICH Schwingtechnik at any time.
- must be available at all times to personnel operating the unbalance exciter/oscillating machine.
- must be read and understood by service personnel prior to commencing maintenance or repair work on the unbalance exciter.
- conforms to the unbalance exciter`s technical specification level at the time of delivery; subsequent amendments must be sufficiently documented and kept with the technical instructions. This also applies to all other copies of the technical instructions issued by us with the ubalance exciter.
- is not, and may not amend part of an earlier or existing statement, agreement or legal relation. All obligations on the part of FRIEDRICH Schwingtechnik towards the customer are contained in the purchase agreement also containing the complete and solely valid guarantee rules. These contractual guarantee conditions are neither complemented nor limited by the technical instructions.

1.3 Explanation of pictographs used

The following pictographs are used to facilitate work on these technical instructions and to help you find what you are looking for.
In principle, you should inform other users of the oscillating device as to all warnings.

Information

This involves basic information and recommendations from FRIEDRICH Schwingtechnik. The following paragraph is to promote understanding or make your work easier. This paragraph does not have to be read. Failing to consider this will not result in direct danger or adverse affects.

Tests and checks

Notes on the necessity of regular checks on oil levels and bolt fittings. Failure to observe this sign may lead to danger or damage.

Avoiding material damage

Refers to increased danger of damage to the unbalance exciter, e.g. due to the use of incorrect tools, wrong type of oil, contaminated parts in contact with driving components, incorrect assembly sequence or inadequate transport. The opposite paragraph must be read and understood. Failure to observe this sign may lead to danger or damage.

Special tools

This refers to the requirement to use special tools.

Please read

This refers to standards and documents that must be read and understood.

General warning

This pictograph gives a general warning. This refers to dangers, possible malfunctions, incorrect use or other things concerning work safety. The opposite paragraph must be read and understood. Failure to observe this sign may lead to danger or damage.

Warning of danger of injury

This pictograph warns of a possible danger of injury. This refers to dangers, incorrect use or other things regarding work safety. This point requires careful attention and special measures must be taken. The opposite paragraph must be read and understood. Failure to observe this sign may lead to danger or damage.

Warning of high voltage

This pictograph warns of electrical currents and resulting dangers. Appropriate measures must be taken against this. The opposite paragraph must be read and understood. Failure to observe this sign may lead to danger or damage.

Warning when transporting
This pictograph warns of increased dangers that may occur when transporting the unbalance exciter. The opposite paragraph must be read and understood. Failure to observe this sign may lead to danger or damage .

Important advice
This pictograph indicates an important recommendation or explanation. The opposite paragraph must be read and understood. Failure to observe this will not lead to immediate danger but can affect the machine`s operation.

2. General

FRIEDRICH unbalance exciter machines are designed for operation in the interior of oscillating machines, sieving machines or other vibration equipments with particularly high payloads and/or very high transport performance.
The unbalance exciter machines consist of a robust cast iron housing with two shafts connected by gearwheels housed in generously proportioned special roller bearings with increased carrying force and bearing play. Lubrication of the bearings and gearwheels is carried out by a combination of immersion in oil and oil mist lubrication.
Centrifugal weights are fitted on the end of each shaft. Up to 12 additional weights of steel or lead can be added to these depending on the use and required conveyor capability.
The centrifugal weights linked by force synchronization are set into operation in opposing directions by an external standard drive motor via a propeller shaft. The propeller shaft is linked via a connection piece with a centrifugal weight from the long shaft. In contrast to unbalanced motors, unbalance exciter machines do not experience transverse vibrations when starting up or coasting due to asynchronous running.

There is the possibility of deploying speed-adjustable drive motors when using FRIEDRICH unbalance exciter machines in a regulated vibration equipment. Pole changing motors and motors with electric speed adjustment can be used or a variable speed gear inserted between the unbalance exciter and the standard revolution engine.

As rotary motors, all commercially normal motors of 50 Hz and 60 Hz may be used at the stated voltages. Pay attention not to exceed the highest permissible revolutions (see chapter 11. Technical data).

All FRIEDRICH unbalance exciters are put through an internal test run in our factory prior to delivery.

Each FRIEDRICH Schwingtechnik unbalance exciter is fitted with the following type plate:

3. Correct use

The unbalance exciter is designed exclusively to drive an oscillating machine.
Dimensioning of the oscillating equipment must correspond to the parameters of the unbalance exciter.

The operation of the unbalance exciters is only permitted if the shafts are in a horizontal position.

Any other or extended use is deemed inappropriate. No claim may be made against FRIEDRICH Schwingtechnik for damage resulting from this.

Correct use also entails observing the operating instructions and in particular the inspection and maintenance instructions.

4. Safety notes

The unbalance exciter may only be taken into use if it has been correctly installed with the respective machine and all protective devices.

All maintenance and adjustment work on the unbalance exciter may in principle to be carried out with the machine at a standstill. Steps must be taken to ensure the unbalance exciter cannot be turned on by accident or by unauthorized personnel prior to starting this work.

Important: When using and working with the unbalance exciter, its centrifugal weights may turn over unexpectedly. There is a danger of knocking or pressing.

5. Transport

In order to avoid danger to persons and damage to the unbalance exciter, the appliance should be transported with the necessary care. As well as the following points, general and local health and safety rules must be observed.

The following is of special importance:

- **When transporting out of Europe, the centrifugal weights must be secured or dismounted, otherwise the bearings may be damaged because of mechanical shocks.**
- The correct use of transport and lifting devices must be ensured.
- When transporting unbalance exciters on pallets, make sure they cannot tip over.
- Only DIN 580 ring bolts must be used for installing the unbalance exciter. Ropes, shackles, etc. may only be fitted to these ring bolts.
- Lifting gear must be approved, undamaged and suitable for transport.
- No additional weight may be fitted to the exciter as the ring bolts are only designed for the exciter`s own weight.
- For safety reasons, devices for lifting the unbalance exciter must have double the lifting capacity of weight of the unbalance exciter.
- The unbalance exciter may only be placed on its footing.
- All transport damage must be reported to the manufacturer. Special care must be taken to ensure bearing surfaces and protective covers are undamaged.

It is not allowed to use protective covers, shafts or centrifugal weights for suspension of the unbalance exciter.
Heavy knocks or falls will damage the bearings in the exciter and reduce the exciter`s life span. The centrifugal weights and the shafts may not come into contact with the lifting device. Do not use damaged exciters.

Table 1: Capacity of lifting devices

Type	Permitted capacity of lifting devices	Ring bolt
	[kg]	DIN 580
UE 5,3-6 (F)	316	M 16
UE 6-6 (F)	324	M 16
UE 8-6 (F)	494	M 16
UE 10-6 (F)	508	M 16
UE 16-6 (F)	682	M 16
UE 24-8 (F)	778	M 16
UE 12-4 (F)	720	M 20
UE 17-6 (F)	796	M 20
UE 20-6 (F)	828	M 20
UE 30-6 (F)	1126	M 20
UEV 30-6 F	962	M 20
UEV 36-6 F	992	M 20
UEV 40-8 F	1242	M 20
UEV 45-8 F	1090	M 20
UE 50-6 (F)	1640	M 24
UE 58-6 (F)	1700	M 24
UE 67-8 F	1988	M 24
UE 80-8 F	1988	M 24
UE 65-6 (F)	1794	M 24
UE 88-6 F	2254	M 30
UE 125-8 F	2572	M 30

6. Assembly

The unbalance exciters are delivered ready for installation but without oil filling. When installing, the following must be observed :

- Check the delivery for completeness in accordance with chapter 6.1 - "Unpacking and checking the delivery contents".
- Transport the unbalance exciter in accordance with chapter 5 "Transport" to the installation location.
- Ensure the dimensional accuracy and suitability of the installation location in accordance with chapter 6.2 - "Installation guidelines".
- Carry out the fitting onto the oscillating machine in accordance with chapter 6.3 - "Assembly on location".
- Adjust the centrifugal weights or the working torque in accordance with chapter 8.
- The operation of unbalance exciters is only permitted if the shafts are in a horizontal position.

Important: Carefully remove all paint, grease and oil from bearing surfaces of the unbalance exciter and surfaces onto which the oscillating machine is to be fitted prior to installation.

In principle, when installing unbalance exciters, local and national health and safety rules must be observed.

Important: When using and working with the unbalance exciter, its centrifugal weights may turn over unexpectedly. There is a danger of knocking or pressing.

6.1 Unpacking and checking delivery contents

Unpack the unbalance exciter and check the delivery contents against the delivery note.

Dispose of the packaging material in accordance with respective disposal conditions.

6.2 Installation guidelines

Requirements of the installation location:

The terminal to which the unbalance exciter is fitted must be:

- level
- vibration free
- free of paint, rust, grease and oil
- flat

6.3 Assembling on location

The unbalance exciters are installed as follows:

- Assembly of the unbalance exciter requires a level, vibration-free drive bracket. This base must be mechanically processed in order to maintain a perfect bearing surface.
- The unbalance exciter machines are secured with DIN 931 or DIN 933 - 8.8 hexagon bolts and DIN 982 or 985 - 8 self-locking hexagon bolts. It is not allowed to use neither split lock washers, serrated lock washers nor something like this. If washers are used, they must be high-strength washers, e.g. HV-washers according to DIN6916 are suitable.
- All the fastening elements can be used only one time.

- Fastening screws require a certain minimum grip of bolt in order to achieve preliminary tension. Minimum grip of bolt must be triple of the nominal diameter.
- The required length of bolt and projection is calculated according to DIN 13.
  Bolt end projection v = length of nut + 3 x thread pitch P
- The hexagon bolts with clamping part should in principle be on the stand side of the unbalance exciter.

The hexagon bolts with clamping part should be tightened using a torque key in accordance with table 2 unless instructions from the vibration machine manufacturer state otherwise. In any case however, instructions from the manufacturer must be observed. If in any doubt, please contact the manufacturer or FRIEDRICH Schwingtechnik.

Table 2: Fastening screws

Type	Bolts 8.8	Nuts 8	Number	Torque [Nm]
UE 5,3-6 (F)	M 20	M 20	6	410
UE 6-6 (F)	M 20	M 20	6	410
UE 8-6 (F)	M 20	M 20	6	410
UE 10-6 (F)	M 20	M 20	6	410
UE 16-6 (F)	M 24	M 24	6	710
UE 24-8 (F)	M 24	M 24	6	710
UE 12-4 (F)	M 24	M 24	8	710
UE 17-6 (F)	M 24	M 24	8	710
UE 20-6 (F)	M 24	M 24	8	710
UE 30-6 (F)	M 24	M 24	8	710
UEV 30-6 F	M 24	M 24	8	710
UEV 36-6 F	M 24	M 24	8	710
UEV 40-8 F	M 24	M 24	8	710
UEV 45-8 F	M 24	M 24	8	710
UE 50-6 (F)	M 36	M 36	8	2530
UE 58-6 F	M 36	M 36	8	2530
UE 67-8 F	M 36	M 36	8	2530
UE 80-8 F	M 36	M 36	8	2530
UE 65-6 (F)	M 36	M 36	8	2530
UE 88-6 F	M 36	M 36	8	2530
UE 125-8 F	M 36	M 36	8	2530

- In the case of bolts prohibiting the use of a torque key due to space restrictions, suitable steps must be taken to achieve the necessary torque. Hydraulic screwdrivers must be used if in doubt (e.g. PLARAD)
- The bolts` torque must first be checked after 40 operating hours. Further checks must be carried out every 1000 hours.

- The unbalance exciter must be filled up with the necessary amount of oil in accordance with chapter 16 - "Oil level chart" and as per the installation position.
- **The unbalance exciters are not supplied with oil!**

- **The ventilation plug must always be situated on the uppermost place of the unbalance exciter.**

Important: if improper bolts, nuts and torques are used, the unbalance exciter may unfasten and cause huge damages.

Possible danger for life!

Important: Note that most malfunctions and breakdowns occur due to incorrect or loose bolt fittings!

6.4 Assembling propeller shaft and drive motor connection piece

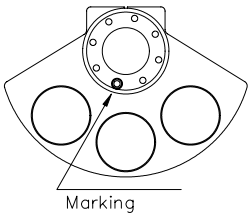
The propeller shaft and the connection piece are fitted between the unbalance exciter and the drive motor.
FRIEDRICH Schwingtechnik does not deliver the propeller shaft and the connection piece to the drive motor as standard.

FRIEDRICH Schwingtechnik recommendation
We strongly recommend the use of a protective box for the propeller shaft to prevent physical injury.

6.4.1 Coupled unbalance exciters

If two unbalance exciters are coupled together, following notes must be respected.

- Unbalances of both exciters must be provided with the same additional weights. Be sure the unbalances of both exciters are exactly in the same position after mounting the propeller shaft. There are marks on the connection piece. The marks must be situated under the shaft.



- The drive motor and the propeller shaft must be adequately dimensioned. Contact us in case of doubt.

Table 3: Connection piece on the unbalance exciter side

Type		**db** [mm]	**d** [mm]	**da** [mm]	**di** [mm]	**t** [mm]
UE 5,3-6 (F) UE 6-6 (F)	BF 01	6 c12	Ø 62 6xM6x30-10.9	75	42h6	1,5
UE 8-6 (F) UE 10-6 (F)	BF 02	8 c 12	Ø 84 6xM8x30-10.9	100	57h6	2,0
UE 16-6 UE 16-6 F	BF 03 BF 04	10 c12	Ø 101,5 8xM10x40-10.9	120	75h6	2,0
UE 24-8 UE 24-8 F	BF 05 BF 04	10 c12	Ø 101,5 8xM10x40-10.9	120	75h6	2,0
UE 12-4 (F) UE 17-6 (F) UE 20-6 (F)	BF 06	10 c12	Ø 101,5 8xM10x40-10.9	120	75h6	2,0
UEV 30-6 F UEV 36-6 F UEV 40-8 F UEV 45-8 F	BF 07	10 c12	Ø 101,5 8xM10x40-10.9	120	75h6	2,0
UE 30-6 UE 30-6 F	BF 08 BF 09	12 c 12	Ø 130 8xM12x50-10.9	150	90h6	2,0
UE 40-8	BF 10	12 c 12	Ø 130 8xM12x50-10.9	150	90h6	2,0
UE 50-6	BF 11	12 c 12	Ø 130 8xM12x50-10.9	150	90h6	2,0
UE 50-6 F UE 58-6 F UE 67-8 F UE 80-8 F UE 65-6 (F)	BF 12	12 c 12	Ø 130 8xM12x50-10.9	150	90h6	2,0
UE 88-6 F UE 125-8 F	BF 13	12 c 12	Ø 130 8xM12x50-10.9	150	90h6	2,0

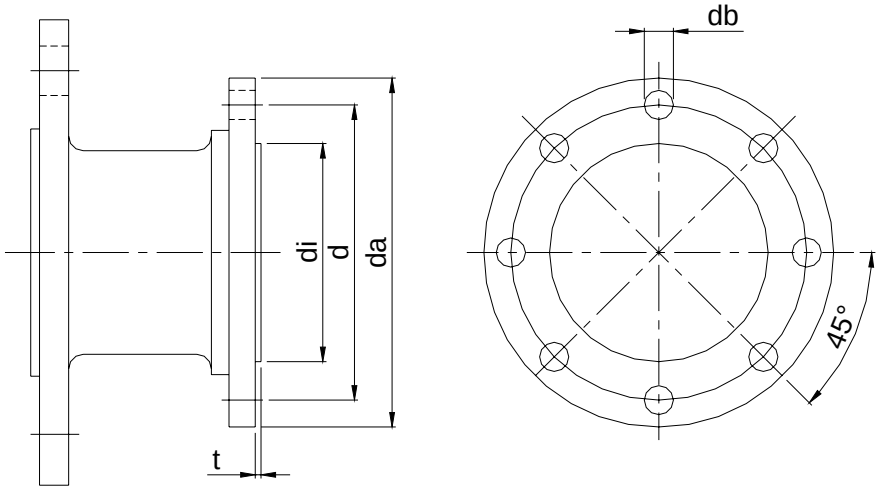
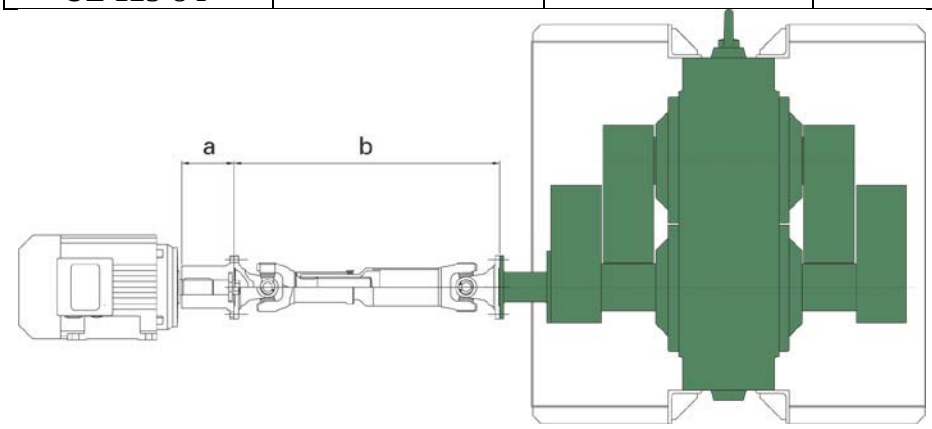


Table 4: Propeller shaft for connection of a single unbalance exciter

Type	Propeller shaft	Fitting length b [mm]	Flange (DIN)	Weight [kg]
UE 5,3-6 (F) UE 6-6(F)	GF 1 short GF 1	315 – 355 327 - 367	Ø 62 6xM6x30-10.9	3
UE 8-6(F) UE 10-6(F)	GF 5 short GF 5	346 – 406 416 - 546	Ø 84 6xM8x30-10.9	5,7
UE 16-6(F) UE 24-8(F) UE 12-4(F) UE 17-6(F) UE 20-6(F) UEV 30-6 F UEV 36-6 F UEV 40-8 F UEV 45-8 F	GF 2 short GF 2	409 – 509 449 - 589	Ø 101,5 8xM10x40-10.9	8,4
UE 30-6(F) UE 40-8 UE 50-6(F) UE 67-8 F UE 80-8 F UE 65-6(F) UE 88-6 F UE 125-8 F	GF 3 short GF 3	504 – 614 559 - 714	Ø 130 8xM12x50-10.9	14,2



6.5 Assembling the protective boxes

The protective boxes must be assembled prior to taking the unbalance exciter into use.

The fitting locations on the unbalance exciter and the protective boxes must be cleaned prior to assembly.

The following sequence must be observed on installation:

- Both main segments are fitted with the lower closing sheets first.
- The four plates are then placed over the slots. Make sure that a shorter plate is fitted to the side on which the connecting flange is mounted. This should be mentioned when ordering coupled unbalance exciters or a shorter plate ordered separately. Operation, including test runs are not permitted without side plates and will release FRIEDRICH Schwingtechnik from any liability.
- The cover of the propeller shaft must be assembled. This is not supplied with the protective box.

Important: The protective box must be completely assembled to be enough rigid. Otherwise, damage to the protective box cannot be excluded.

All bolts must be assembled without gaps and tightened up using a torque screw. The values for this are to be taken from table.

The bolts` torque must first be checked after 40 operating hours. Further checks must be carried out every 1000 hours.

Use only original parts provided by FRIEDRICH Schwingtechnik, otherwise mechanical and physical injury may occur.

Table 5: Fastening torque for bolts on the protective box

Bolt	Fastening torque
M 8	22 Nm
M 12	80 Nm
M 16	210 Nm

The unbalance exciter may not be taken into use without a completely assembled protective box. This also applies to test runs. The protective box protects against malfunction of the unbalance exciter as well as from rotating parts. Operation without the protective box will release FRIEDRICH Schwingtechnik from any liability.

6.6 Drive

FRIEDRICH Schwingtechnik does not include the drive motor in the delivery.

Both electrical motors and hydraulic motors can be used. The hydraulic motors must provide slow start, The motors can be connected with the unbalance exciter via a propeller shaft or a V-belt.

Note the following on the design of the unbalance exciter drive motor for the oscillating machine provided:

- Please see chapter 11 - "Technical data" for the electric drive motor required. The fastening torque in the range 0-300 min^{-1} must be 2.5 times the nominal torque.
- Please see chapter 11 - "Technical data" or the type plate for the highest permitted range.

Important:

- The minimum range n_{min} may only fall short of 500 min^{-1} with written permission from FRIEDRICH Schwingtechnik.
- The maximum range n_{max} in accordance with chapter 11 may only be exceeded with written permission from FRIEDRICH Schwingtechnik.

- **Failure to observe this may result in material or physical damage.**
- **The falling short or exceeding of permissible ranges without prior written permission will release FRIEDRICH Schwingtechnik from any liability.**

After switching off the drive motor, the exciter goes through the machine's frequency range and outlet vibration occur. Thi will lead to a slowing down of the transported material or vibrating of the oscillating machine. These undesired outlet vibrations can be avoided to a large extent by slowing down the motor whereby the brake may be operated at will. FRIEDRICH Schwingtechnik recommends braking via a DC brake.

The braking torque must not be greater than the motor's starting torque.

The unbalance exciter may only be started up if the oscillating machine is at a complete standstill.

6.7 Electrical connection

Electrical connection of the unbalance exciter drive motor may only be carried out by authorized specialist personnel according to the regulations and standards applying at the installation location.

On the ground of safety reasons an emergency circuit breaker must be used.

Important: Earth the drive motor according to the relevant protective regulations.

7. Testing guidelines

Important: Oscillating machines may in principle only be switched on at a standstill to avoid vibrations in the resonance range.

Check the following points before commencing the test run:

- Free movability of all vibrating parts.
- Proper oil and grease filling for the driving components according to details in chapter 15 - "Selection of available gear oils" and chapter 16 - "Oil level chart".

- Installation location of the unbalance exciter within permissible environmental temperatures of -40°C and +50°C.

The test run may only be started from a local control station so intervention is possible at any time in the event of physical or material danger. An acoustic and if necessary, a visual signal of sufficient length must be given before starting the unbalance exciter.

The unbalance exciter should initially run one to two hours unloaded. The machine can be taken into use under load after checking the bolts for secure seating. Ensure the maximum operating temperature of +80°C is not exceeded.

The unbalance exciter may not be taken into use without a completely assembled protective box. This also applies to test runs. The protective box protects against malfunction of the unbalance exciter as well as from rotating parts. Operation without the protective box will release FRIEDRICH Schwingtechnik from any liability.

8. Storage and internal preservation

After successful finishing of the test run performed on our testing stand, all the unbalance exciters are given preservation for at least 12 months.

It is intended to store the exciters inside closed dry stores under normal environmental conditions.
In case of aggressive, moist environmental conditions, e.g. in tropics, storage life is reduced to 6 months.

When using an unbalance exciter after long time of inactivity, it is not necessary to wash it out. It must be filled with oil according to tables 8.1– 8.4. Free movement of the shafts must be checked by hand.
If the shafts are not free to move, we recommend to let the unbalance exciter dismantle and clean at the producer.

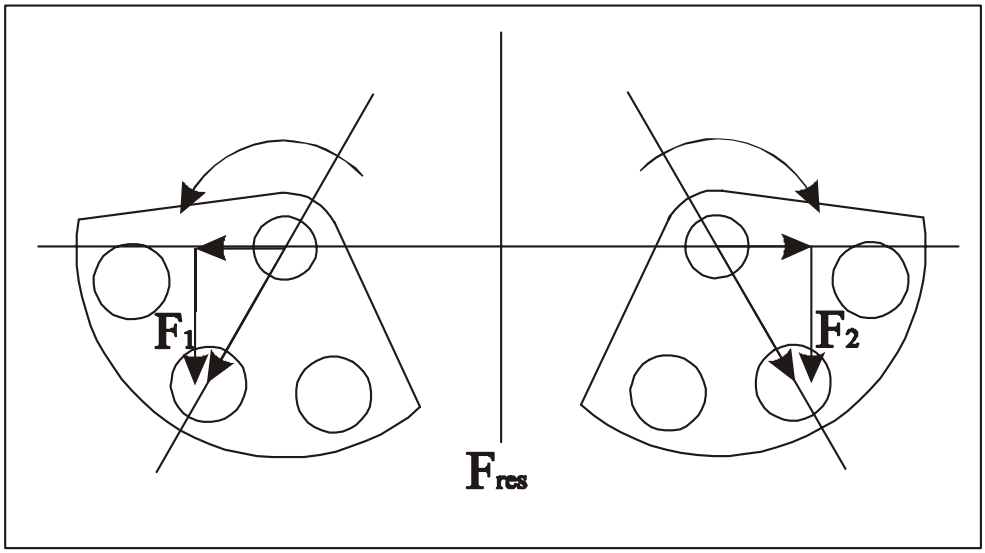
If an unbalance exciter should be stored also after expiration of the storage life, you must keep to the following way.
Fill up the unbalance exciter with oil and rotate the shafts by hand. After that, get the oil out again.

If vapour proof packaging is used, it is absolutely essential that as much of the solvent as possible be evaporated from the interior. It is advisable not to seal available ventilation devices for transport - including sea transport - and subsequent storage. Packaging must be agreed with the supplier or the packaging company as regards destination and storage time.

9. Alteration of swing

The unbalance exciter machines have two gearwheel force-synchronized shafts fitted with unbalances. The circulating masses produce a circulating radial power F of the same frequency on both shafts. An alternating force of value $F_{res} = F_1 + F_2$ in the direction of the exciter stand is produced due to the inverse synchronous circulation of the imbalances. An important characteristic for the selection of unbalance exciters is the so-called "static torque". The static torque of unbalance exciters is defined as the weight of all unbalances multiplied by the radius of the centre of gravity. FRIEDRICH Schwingtechnik uses working torque instead of static torque. This is calculated by doubling the static torque. Working torque is normally expressed in [kgcm].

Fig. 1



The amplitude of oscillation of vibrating movement of the vibration device is calculated from the unbalenced exciter's working torque and the weight of the vibrating parts on the vibration device as follows :

$$\text{Swing} = \frac{\text{Working torque [kgcm]}}{\text{Mass of oscillating parts [kg]}} = 2 * \text{Amplitude [cm]}$$

The oscillation device's static and thus working torque can be altered in stages with the machine at standstill by installing and removing additional weights. Please see table 6 - "Working torque according to the additional weights" for the grading of the additional weights. By altering the swing, there is a possibility of altering the throughput of the vibration device.

Chapter 10 - "Removal and installation of additional weights" gives information on changing additional weights.

Table 6 shows the amount of working torque depending on the number and position of additional weights. This table shows installed additional weights by complete circles.

The working torque stated shows an individual unbalance exciter. The oscillating machine's entire working torque is calculated by the addition of the working torque of all added unbalance exciters.

Fig. 2

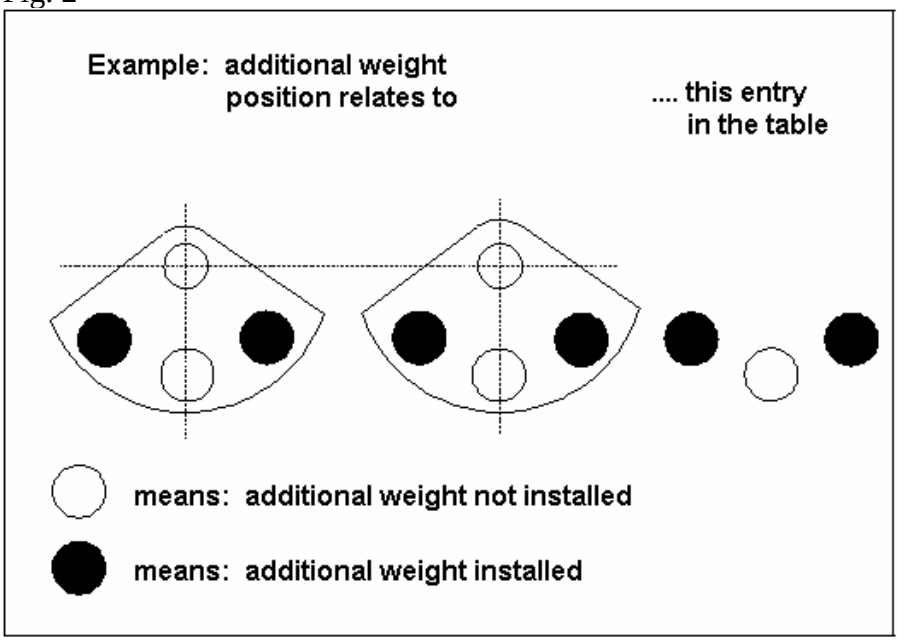

Example: additional weight position relates to
.... this entry in the table
means: additional weight not installed
means: additional weight installed

Table 6: Working torque depending on the additional weights

Type	Additional weight material	Position of additional weights [kgcm]			
		O O O	O O •	• • O	• • •
UE 5,3-6 (F)	Steel	390	460	480	540
UE 6-6 (F)	Lead	390	490	520	620
UE 8-6 (F)	Steel	630	740	780	860
UE 10-6 (F)	Lead	630	790	850	1010
UE 16-6 (F)	Steel	1010	1260	1360	1600
UE 24-8 (F)	Steel	1520	1890	2040	2400
UE 12-4 (F)	Steel	790	950	1020	1190
UE 17-6 (F)	Steel	1190	1430	1530	1780
UE 20-6 (F)	Lead	1190	1540	1690	2040
UE 30-6 (F) UEV 30-6 F	Steel	1730	2270	2500	3040
UEV 36-6 F	Lead	1730	2530	2840	3600
UEV 40-8 F	Steel	2280	2990	3290	4000
UEV 45-8 F	Lead	2280	3580	3830	4460
UE 50-6 (F)	Steel	2830	3770	4160	5100
UE 58-6 F	Lead	2830	4380	4820	5880
UE 67-8 F	Steel	3780	5030	5550	6800
UE 80-8 F	Lead	3780	5780	6410	7930
UE 65-6 (F)	Lead	3000	4510	5140	6640
UE 88-6 F	Steel	5580	6830	7530	8800
UE 125-8 F	Steel	7800	9560	10540	12300

If the centrifugal force is to be altered, proceed as described in chapter 10 - "Installation and removal of additional weights".
The additional weights must be installed symmetrically to the centrifugal weights'centreline. The same number of the same additional weights in the same positions are to be installed in all centrifugal weights.

In principle, one must be careful to adjust the working torque as low as possible to achieve as high a shelf life of the unbalance exciter and the machine as possible.

Important: Ensure the centrifugal force is equally adjusted on all unbalance exciters if several unbalance exciters are to be used on one oscillating machine.

Switch off the oscillating machine immediately if an unbalance exciter goes down during operation; it may only be operated together with all unbalance exciters.

Replacement unbalance exciter

On installation, it is advisable to compare the mounting of the additional weight with an unbalance exciter to be connected with a propeller shaft in order to ensure the same additional weight mounting in number and position has been installed in all centrifugal weights.

10. Removing and installing additional weights

Removing and installing additional weights are carried out like all works on the vibration device when the machine is at standstill. Ensure the machine cannot be switched on by accident by disconnecting the drive motor.

Important: When using and working with the unbalance exciter, its centrifugal weights may turn over unexpectedly. There is a danger of knocking or pressing.

It is strongly recommended that the number or type of additional weights on all centrifugal weights be changed symmetrically.

Important: Install the same number of additional weights in the same position on all four centrifugal weights!

Additional weights of steel or lead are available for unbalance exciter machines.
It is imperative to stick to the selection of additional weights according to specification!

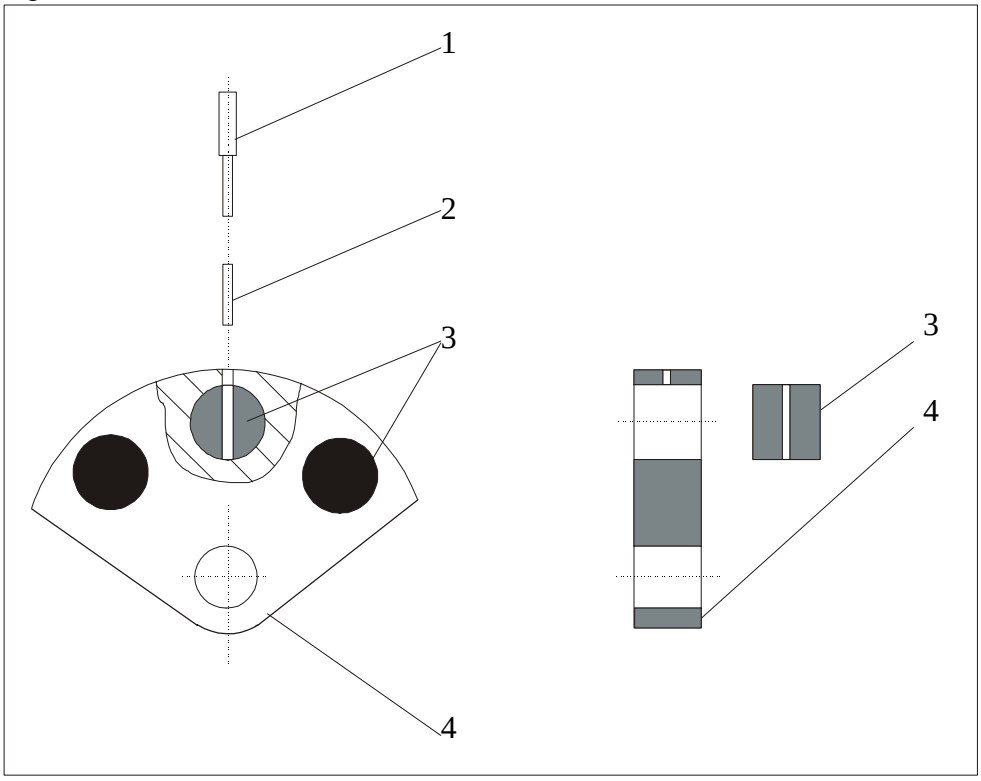
10.1 Removing additional weights

Check to see whether there is movement on the centrifugal weights when removing additional weights. There is a danger of knocking or pressing.

- Commence with removal of additional weights on the long shaft.
- Drive the spring pin radially into the additional weight.
- Turn the centrifugal weights so there is no overlap of the additional weights with the centrifugal weight on the short shaft.
- Remove the additional weight from the exciter housing by lightly tapping it.
- Rotate the centrifugal weights on the short shaft so that the centrifugal weights on the cover of the unbalance exciter machine can be removed using a snap through.
- The spring pins in the additional weights must be removed immediately.

Important: if an additional weight with a hammered in spring pin should be used again, you can hammer a second spring pin without possibility to remove the additional weight later.

Fig. 4



Key:

1. Snap through
2. Spring pin
3. Additional weight
4. Centrifugal weights or drive segment

10.2 Installing additional weights

Check to see whether there is movement on the centrifugal weights when installing additional weights. There is a danger of knocking or pressing. Removal of the centrifugal disks is recommended.

- Remove paint and dirt from the holes on the centrifugal weights.
- Remove paint and dirt from additional weights and clean corrosion inhibitor from new additional weights. Check to see whether the hole is free from retracted spring coils.
- Align additional weights so that the radial hole roughly corresponds with the radial hole on the centrifugal weights.
- Insert the additional weights into the centrifugal weights. Ensure the centrifugal weights are not struck by blows from a hammer.
- Align the holes on the centrifugal weight and additional weight using a snap through.
- Drive the spring coil into the radial hole. Ensure the spring coil is flush with the centrifugal weight.

11. Dimensions [mm]

Type	Fig.	a	b	b1	c	e	f	g	h	k	l	m	n	Fastening screws
UE 5,3-6 (F) UE 6-6 (F)	A	100	170	60	25	260	230	539	387	257,5	445	85	230	6x M20-8.8
UE 8-6 (F) UE 10-6 (F)	A	100	200	70	30	270	270	604	422	266	460	100	240	6x M20-8.8
UE 16-6 UE 16-6 F UE 24-8 UE 24-8 F	B	100	200	-	40	270	270	670	500	372,5 303 372,5 353	646 520 646 620	120	285	6x M24-8.8
UE 12-4 (F) UE 17-6 (F) UE 20-6 (F)	C	110	200	80	35	400	270	700	485	366	650	112	280	8x M24-8.8
UEV 30-6 F UEV 36-6 F	C	110	200	100	35	400	270	770	520	424	766	125	300	8x M24-8.8
UE 30-6 UE 30-6 F UEV 40-8 F UEV 45-8 F	C	110	200	100	35	400	270	770	520	508,7 481 484 484	912 820 886 886	125	300	8x M24-8.8
UE 50-6 UE 50-6 F UE 58-6 F UE 67-8 F UE 80-8 F	C	140	250	100	53	510	340	860	615	548 453 453 513 513	964 843 843 964 964	150	360	8x M36-8.8
UE 65-6 (F)	C	140	250	100	53	510	340	860	615	475	843	150	360	8x M36-8.8
UE 88-6 F UE125-8 F	C	165	310	177	45	650	400	1060	675	499 579	902 1062	175	370	8x M36-8.8

Fig. A

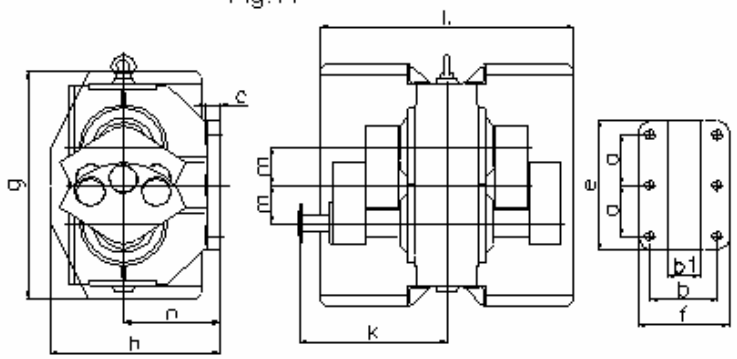


Fig. B

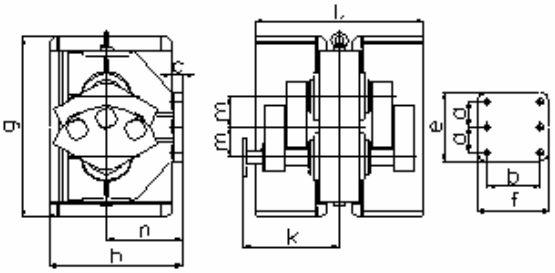
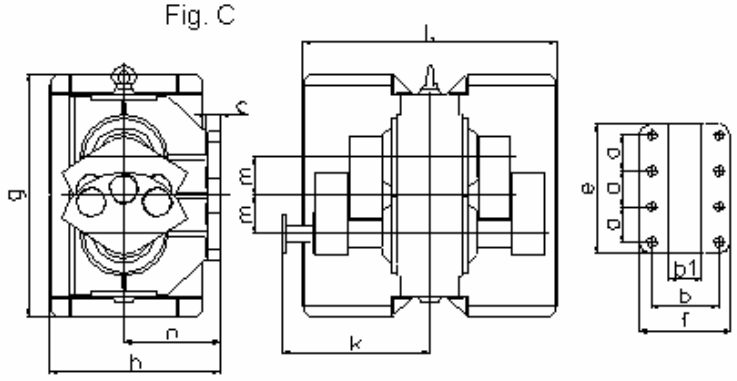


Fig. C



12. Technical data

Type	Speed [min^{-1}]	Working torque [kgcm]		Centrifugal force [kN]		Nominal power of drive motor [KW]	Weight [kg]		Protective boxes [kg]
		min	max	min	max		min	max	
UE 5,3-6 (F)	1000	390	540	21,3	29,6	2,2	116	126	16
UE 6-6 (F)	1000	390	620	21,3	34,0	2,2	116	129	16
UE 8-6 (F)	1000	630	860	34,5	47,1	3,0	170	183	20
UE 10-6 (F)	1000	630	1010	34,5	55,4	3,0	170	189	20
UE 16-6 (F)	1000	1010	1600	54,8	87,7	5,5	230	255	27
UE 24-8 (F)	750	1520	2400	46,8	74,0	5,5	263	288	30
UE 12-4 (F)	1500	790	1190	97,4	146,8	15,0	279	297	31
UE 17-6 (F)	1000	1190	1780	65,2	97,6	7,5	308	335	31
UE 20-6 (F)	1000	1190	2040	65,2	111,8	7,5	308	346	31
UE 30-6 (F)	1000	1730	3040	91,1	160,1	11,0	458	515	56
UEV 30-6 F	1000	1730	3040	91,1	160,1	11,0	422	478	40
UEV 36-6 F	1000	1730	3600	91,1	189,5	11,0	422	503	40
UEV 40-8 F	750	2280	4000	70,3	123,3	15,0	454	525	44
UEV 45-8 F	750	2280	4460	70,3	137,5	15,0	454	554	44
UE 50-6 (F)	1000	2830	5100	155,1	279,6	15,0	689	769	50
UE 58-6 F	1000	2830	5880	155,1	322,4	15,0	689	804	50
UE 67-8 F	750	3780	6800	116,5	209,7	15,0	883	939	54
UE 80-8 F	750	3780	7930	116,5	244,5	18,5	883	983	54
UE 65-6 (F)	1000	3000	6640	164,5	364,1	15,0	729	855	50
UE 88-6 F	1000	5580	8800	300,5	482,5	22,0	924	1029	98
UE125-8 F	750	7800	12300	240,5	379,3	22,0	1030	1177	109

13. Lubrication instructions

Important: Unbalance exciter machines are delivered without oil. Before taking into use, fill with oil in accordance with the oil level and oil type charts.

Important: The dipstick is only used to check the oil level and must again be replaced with a screwed sealing plug for operating the unbalance exciter.

Important: The operation of unbalance exciters is only permitted if the shafts are in a horizontal position.

Please follow the information in the following chapters:

14. Oil change intervals
15. Selection of available gear oils
16. Oil level chart

Important: Only fill or refill with oil after the unbalance exciter or its motor has been switched off and measures have be taken to prevent accidental or unauthorized switching on. Otherwise, there is a danger of knocking or pressing!

Unbalance exciters are provided with several screwed sealing plugs. The ventilator plug must be fitted above the unbalance exciter oil level, as high as possible. A screwed sealing plug is replaced with a ventilator plug. Depending on the installation position, one of these screwed sealing plugs is to be selected as an oil-drain plug and one as an oil filler plug. The screwed sealing plug at the lowest point should be chosen as the oil-drain plug and the easiest to

access is best selected as the oil filler plug. All the screwed sealing plugs are provided with a magnet for extracting metal debris from the gearing out of the oil bath occuring during the initial operation period.

The seal rings according to DIN 7603 must be replaced each time the screwed sealing plugs are loosened. **There is otherwise the risk of oil leaking and thus damage to the unbalance exciter!**

Only high quality doped oils in accordance with DIN 51519 and DIN 51502 are to be used.

If an unbalance exciter is operated using a certain oil from a certain manufacturer and the intention is to change to the same quality oil from a different producer, we recommend the unbalance exciter be completely drained and only then filled up with the new oil as oils are not always mixable due to oil additives that differ according to producers.
The oil level depends on the installation situation of the unbalance exciter and is shown in chapter 16. It is important that a quantity of oil should always be visible up to the middle of the dipstick in the unbalance exciter's housing.

Too much oil in the housing can lead to an oil blockage leading to overheating and damage to the bearings. Moreover the oil runs out. On the other hand, too little oil will lead to seizure and damage to the gearing and the roller bearings.

- The oil level should be checked via the dipstick about half an hour after switching off the vibration device.

Important! The oil level should be checked once a month.

- When changing the oil, make sur that as much old oil is removed as possible and the metal debris cleaned from the magnetic oil-drain plug.
- When filling with oil, ensure that no dirt particles get into the ubalance exciter. Use a funnel with finely woven screen cloth.

- Before the appliance is taken into use, check the oil-drain plug and the oil sealing plugs are seated firmly. This should be repeated after 40 hours and later at longer intervals.

14. Oil change intervals

We recommend the following oil change intervals:

- First oil change after ca. 500 operating hours, no later than three months
- Second oil change after ca. 1,000 operating hours, no later than six months
- All other oil changes after 1,000 operating hours

The above oil change intervals are reference values. These intervals can be reduced or extended if necessary, according to environmental conditions. Exact oil change intervals can be set on consultation with the oil supplier and the respective oil checks can be carried out by taking occasional samples.

The oil should be changed at shorter intervals if the oil is heavily soiled by unfavourable operating conditions by the time the first oil change is carried out. **More frequent oil changes increase the life span of the unbalance exciter.**

15. Selection of used gear oils

Gear oil with required viscosity is determined according to table 7 depending on environmental temperatures.

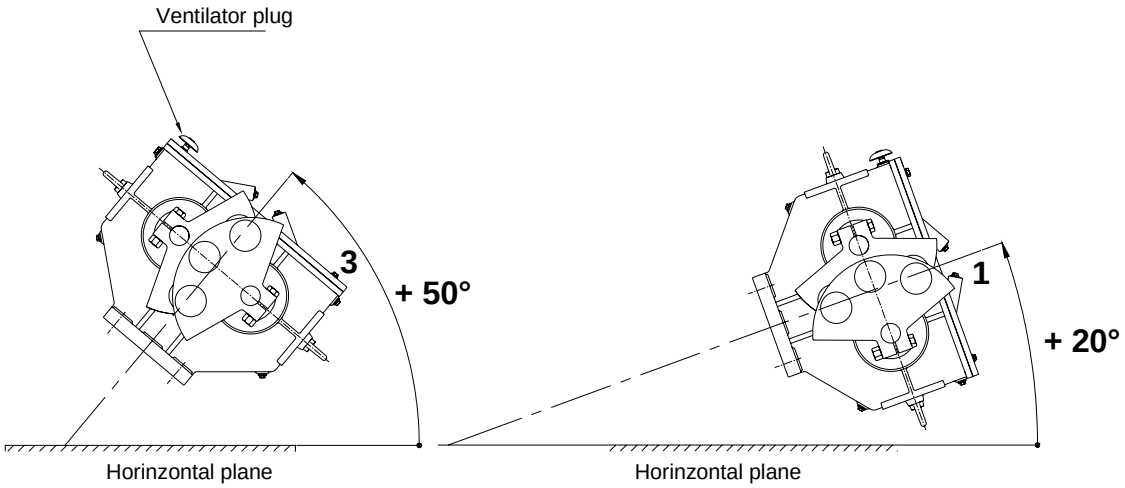
Table 7: Viscocity class depending on environmental and operating temperatures

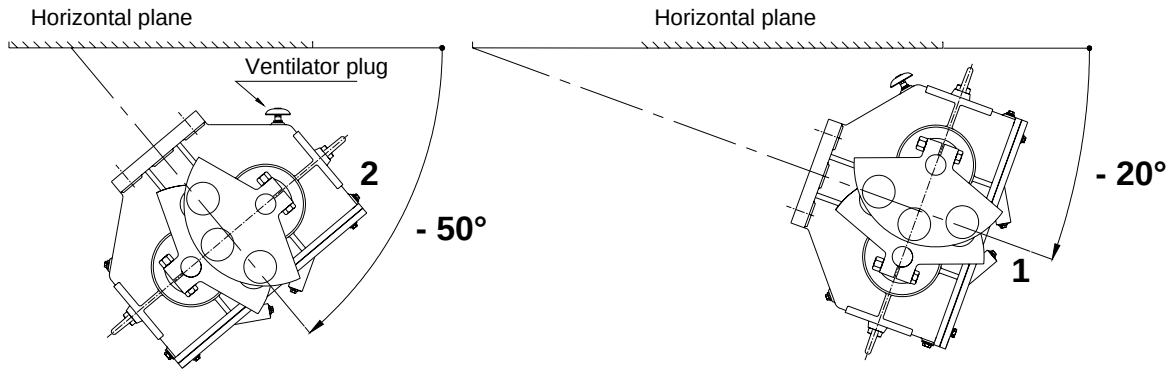
Environmental temperature	Operating temperature	Identification to DIN 51519 ISO 3498	Identification to DIN 51502
°C	°C		
-40°C to -25°C	-10°C to +5°C	VG 5	
-30°C to -10°C	0°C to +20°C	VG 10	
-15°C to +20°C	+15°C to +50°C	VG 68	CLP 68
+15°C to +50°C	+45°C to +80°C	VG 100	CLP 100

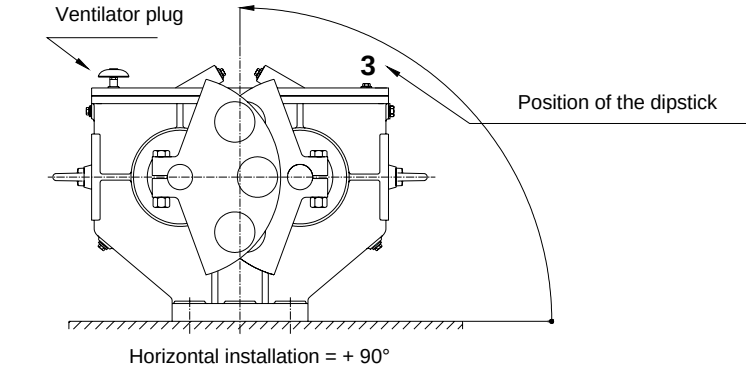
16. Oil level charts

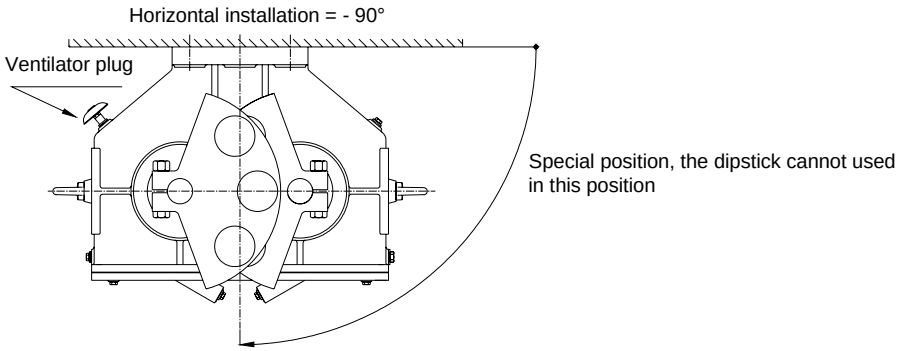
16.1 How to understand the following angle indications

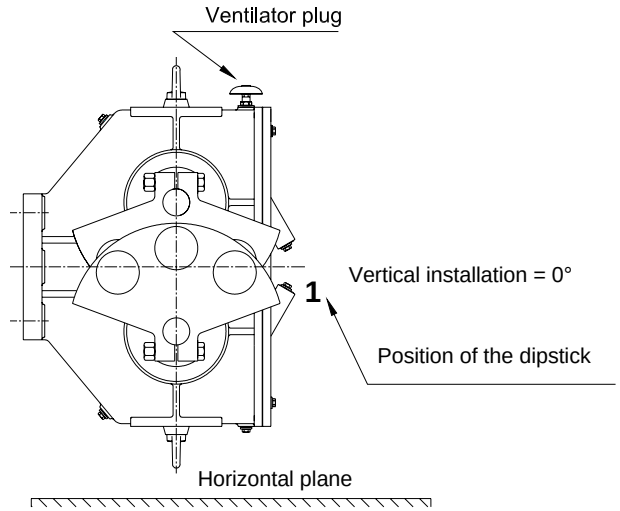
- Depending on various mounting options of the unbalance exciters, there are possible various angles of installation, where the dipstick must be used to ensure correct oil level.
- Warning! Angle from horizontal plane is decisive, you must add angle of the girder and tilt angle of the machine.
- Warning! The illustrated position for the dipstick is an example only. Correct positions are mentioned in the tables.
- The ventilator plug must be fitted as high as possible.





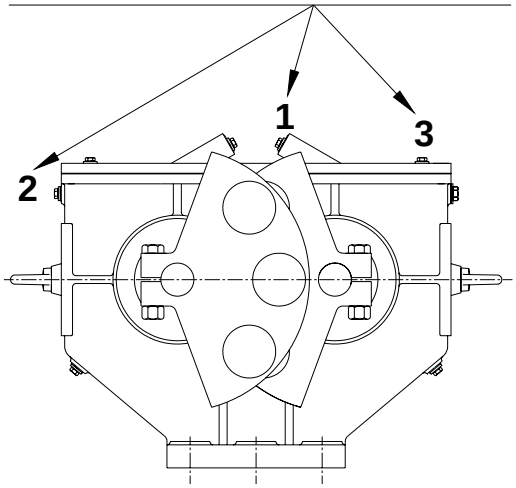






- The dipstick is delivered with maximum length and without marking. It is necessary to provide marking according to the table and to cut the dipstick cca 5 mm under the minimum mark.
- The unbalance exciters with additional designation F can be installed into various angular positions. Accordingly other positions for the dipstick exist.

Positions for the dipstick



Marking of the dipstick

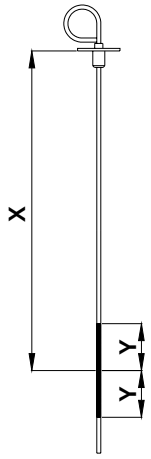
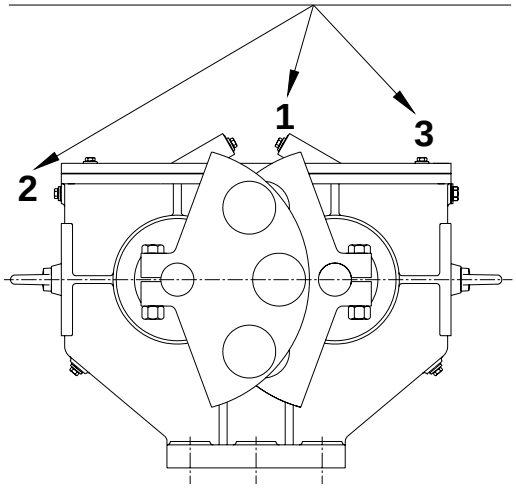


Table 8.1

	UE 5,3-6 F UE 6-6 F			UE 5,3-6 UE 6-6			UE 16-6 F UE 24-8 F		
	Oil quantity 0,8 – 3,1 l			Oil quantity 0,8 – 1,7 l			Oil quantity 1,0 – 5,0 l		
Install. angle	X [mm]	Y [mm]	Position dipstick	X [mm]	Y [mm]	Position dipstick	X [mm]	Y [mm]	Position dipstick
90°	182	7	**3**	-	-	-	267	10	**3**
85°	173	7	**3**	-	-	-	256	10	**3**
80°	164	7	**3**	-	-	-	245	10	**3**
75°	155	7	**3**	-	-	-	235	10	**3**
70°	146	7	**3**	-	-	-	225	10	**3**
65°	138	8	**3**	-	-	-	215	11	**3**
60°	130	8	**3**	-	-	-	206	11	**3**
55°	121	9	**3**	-	-	-	196	12	**3**
50°	112	9	**3**	110	13	**3**	186	13	**3**
45°	102	10	**3**	100	14	**3**	175	14	**3**
40°	91	7	**3**	90	15	**3**	163	15	**3**
35°	176	7	**1**	157	10	**1**	150	17	**3**
30°	167	7	**1**	147	10	**1**	135	20	**3**
25°	158	7	**1**	139	10	**1**	116	22	**3**
20°	150	7	**1**	131	10	**1**	250	10	**1**
15°	142	7	**1**	123	10	**1**	239	10	**1**
10°	134	7	**1**	116	11	**1**	229	10	**1**
5°	127	8	**1**	109	11	**1**	219	11	**1**
0°	120	8	**1**	101	12	**1**	209	11	**1**
-5°	111	9	**1**	94	13	**1**	198	12	**1**
-10°	103	9	**1**	86	14	**1**	188	13	**1**
-15°	94	10	**1**	78	15	**1**	177	14	**1**
-20°	85	11	**1**	69	16	**1**	165	15	**1**
-25°	73	13	**1**	60	18	**1**	151	17	**1**
-30°	61	14	**1**	48	20	**1**	135	20	**1**
-35°	44	16	**1**	33	25	**1**	114	24	**1**
-40°	339	9	**2**	14	30	**1**	87	28	**1**
-45°	332	10	**2**	-	-	-	418	14	**2**
-50°	326	11	**2**	-	-	-	406	15	**2**
-55°	317	13	**2**	-	-	-	392	17	**2**
-60°	309	14	**2**	-	-	-	379	19	**2**
-65°	296	17	**2**	-	-	-	357	24	**2**
-70°	284	20	**2**	-	-	-	336	28	**2**
-75°	254	30	**2**	-	-	-	298	42	**2**
-80°	225	40	**2**	-	-	-	229	56	**2**
-85°	116	79	**2**	-	-	-	-	-	-

Positions for the dipstick



Marking of the dipstick

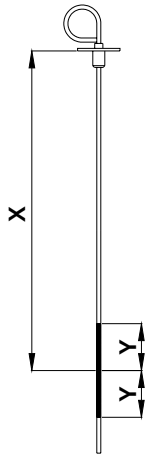
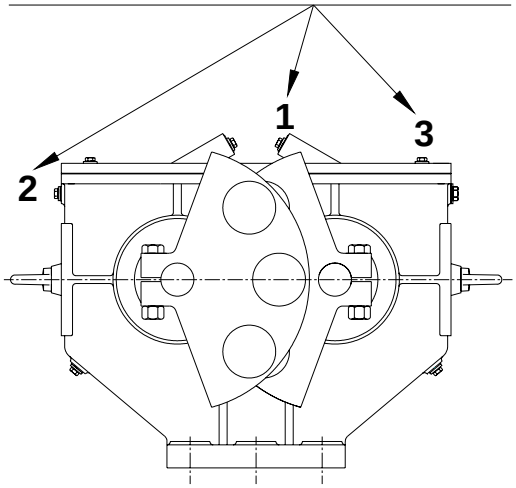


Table 8.2

	UE 8-6 F UE 10-6 F			UE 8-6 UE 10-6			UE 12-4 F UE 17-6 F UE 20-6 F		
	Oil quantity 1,1 – 5,3 l			Oil quantity 1,1 – 1,9 l			Oil quantity 2,2 – 5,2 l		
Install. angle	X [mm]	Y [mm]	Position dipstick	X [mm]	Y [mm]	Position dipstick	X [mm]	Y [mm]	Position dipstick
90°	223	8	**3**	-	-	-	242	9	**3**
85°	213	8	**3**	-	-	-	229	9	**3**
80°	203	8	**3**	-	-	-	216	9	**3**
75°	193	8	**3**	-	-	-	203	10	**3**
70°	184	8	**3**	-	-	-	190	10	**3**
65°	175	9	**3**	-	-	-	179	11	**3**
60°	166	9	**3**	-	-	-	168	11	**3**
55°	156	10	**3**	-	-	-	154	12	**3**
50°	146	10	**3**	140	14	**3**	141	12	**3**
45°	135	11	**3**	130	15	**3**	125	15	**3**
40°	124	12	**3**	120	16	**3**	236	9	**1**
35°	112	14	**3**	206	10	**1**	223	9	**1**
30°	210	8	**1**	194	10	**1**	211	9	**1**
25°	200	8	**1**	185	10	**1**	200	10	**1**
20°	190	8	**1**	176	10	**1**	190	10	**1**
15°	181	8	**1**	167	10	**1**	180	10	**1**
10°	172	8	**1**	158	11	**1**	170	10	**1**
5°	163	9	**1**	150	11	**1**	159	11	**1**
0°	154	9	**1**	140	12	**1**	149	11	**1**
-5°	144	10	**1**	132	13	**1**	139	12	**1**
-10°	135	10	**1**	124	14	**1**	128	12	**1**
-15°	124	11	**1**	113	15	**1**	116	13	**1**
-20°	114	12	**1**	102	16	**1**	104	14	**1**
-25°	100	14	**1**	90	17	**1**	88	17	**1**
-30°	87	16	**1**	75	20	**1**	73	19	**1**
-35°	64	19	**1**	57	25	**1**	51	22	**1**
-40°	41	23	**1**	32	30	**1**	453	12	**2**
-45°	386	11	**2**	-	-	-	444	14	**2**
-50°	378	12	**2**	-	-	-	436	15	**2**
-55°	368	14	**2**	-	-	-	425	17	**2**
-60°	358	16	**2**	-	-	-	414	19	**2**
-65°	343	19	**2**	-	-	-	397	23	**2**
-70°	328	23	**2**	-	-	-	380	27	**2**
-75°	292	35	**2**	-	-	-	340	41	**2**
-80°	257	46	**2**	-	-	-	301	55	**2**
-85°	127	92	**2**	-	-	-	156	109	**2**

Positions for the dipstick



Marking of the dipstick

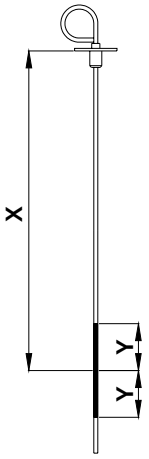
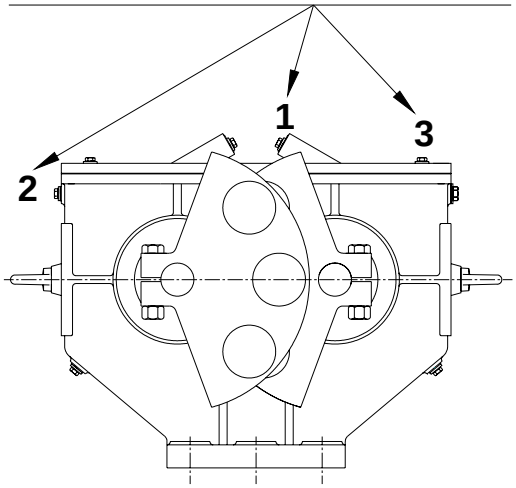


Table 8.3

	UE 17-6 UE 20-6			UEV 30-6 F UEV 40-8 F UEV 36-6 F UEV 45-8 F			UE 30-6 UE 40-8		
	Oil quantity 2,2 – 3,4 l			Oil quantity 2,6 – 9,2 l			Oil quantity 2,6 – 5,2 l		
Install. angle	X [mm]	Y [mm]	Position dipstick	X [mm]	Y [mm]	Position dipstick	X [mm]	Y [mm]	Position dipstick
90°	-	-	-	268	10	**3**	-	-	-
85°	-	-	-	254	10	**3**	-	-	-
80°	-	-	-	241	10	**3**	-	-	-
75°	-	-	-	229	11	**3**	-	-	-
70°	-	-	-	217	11	**3**	-	-	-
65°	-	-	-	204	12	**3**	-	-	-
60°	-	-	-	192	12	**3**	-	-	-
55°	-	-	-	179	13	**3**	-	-	-
50°	147	13	**3**	166	14	**3**	173	13	**3**
45°	133	14	**3**	150	15	**3**	160	14	**3**
40°	118	15	**3**	135	16	**3**	145	15	**3**
35°	219	10	**1**	239	10	**1**	235	10	**1**
30°	207	10	**1**	225	10	**1**	222	10	**1**
25°	196	10	**1**	213	10	**1**	208	10	**1**
20°	186	10	**1**	201	10	**1**	196	10	**1**
15°	176	10	**1**	189	11	**1**	185	10	**1**
10°	166	11	**1**	178	11	**1**	174	11	**1**
5°	156	11	**1**	167	12	**1**	163	11	**1**
0°	146	12	**1**	156	12	**1**	152	12	**1**
-5°	136	13	**1**	144	13	**1**	140	13	**1**
-10°	126	14	**1**	132	13	**1**	130	14	**1**
-15°	115	15	**1**	119	15	**1**	118	15	**1**
-20°	104	16	**1**	106	16	**1**	105	16	**1**
-25°	90	18	**1**	88	18	**1**	90	18	**1**
-30°	75	21	**1**	70	20	**1**	73	20	**1**
-35°	54	25	**1**	46	24	**1**	51	24	**1**
-40°	28	30	**1**	493	14	**2**	25	31	**1**
-45°	-	-	-	482	15	**2**	-	-	-
-50°	-	-	-	471	16	**2**	-	-	-
-55°	-	-	-	458	19	**2**	-	-	-
-60°	-	-	-	442	21	**2**	-	-	-
-65°	-	-	-	424	26	**2**	-	-	-
-70°	-	-	-	398	30	**2**	-	-	-
-75°	-	-	-	359	40	**2**	-	-	-
-80°	-	-	-	286	59	**2**	-	-	-
-85°	-	-	-	-	-	-	-	-	-

Positions for the dipstick



Marking of the dipstick

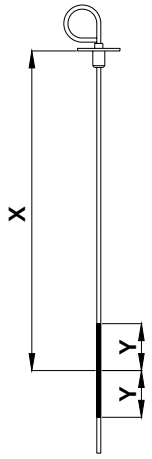


Table 8.4

	UE 50-6 F UE 67-8 F UE 58-6 F UE 65-6 F UE 80-8 F			UE 65-6			UE 88-6 F UE 125-8 F		
	Oil quantity 2,6 – 14,2 l			Oil quantity 2,6 – 5,2 l			Oil quantity 4,0 – 13,7 l		
Install. angle	X [mm]	Y [mm]	Position dipstick	X [mm]	Y [mm]	Position dipstick	X [mm]	Y [mm]	Position dipstick
90°	322	6	**3**	-	-	-	377	5	**3**
85°	307	6	**3**	-	-	-	360	6	**3**
80°	293	6	**3**	-	-	-	344	6	**3**
75°	279	6	**3**	-	-	-	329	6	**3**
70°	265	6	**3**	-	-	-	313	7	**3**
65°	251	6	**3**	-	-	-	299	7	**3**
60°	238	7	**3**	-	-	-	284	7	**3**
55°	224	7	**3**	-	-	-	269	7	**3**
50°	211	8	**3**	215	15	**3**	254	7	**3**
45°	194	8	**3**	200	15	**3**	238	8	**3**
40°	178	8	**3**	185	16	**3**	220	8	**3**
35°	159	8	**3**	265	10	**1**	200	9	**3**
30°	136	10	**3**	250	10	**1**	176	11	**3**
25°	241	6	**1**	240	10	**1**	147	13	**3**
20°	228	6	**1**	225	10	**1**	108	15	**3**
15°	216	6	**1**	210	11	**1**	284	6	**1**
10°	203	6	**1**	200	11	**1**	269	6	**1**
5°	191	6	**1**	190	12	**1**	254	6	**1**
0°	179	6	**1**	175	12	**1**	239	6	**1**
-5°	167	6	**1**	165	13	**1**	224	7	**1**
-10°	153	7	**1**	150	14	**1**	209	7	**1**
-15°	139	8	**1**	140	15	**1**	194	7	**1**
-20°	123	9	**1**	125	17	**1**	178	8	**1**
-25°	104	10	**1**	110	20	**1**	160	9	**1**
-30°	82	11	**1**	90	23	**1**	140	10	**1**
-35°	52	17	**1**	65	30	**1**	117	11	**1**
-40°	574	7	**2**	30	38	**1**	88	12	**1**
-45°	562	7	**2**	-	-	-	48	15	**1**
-50°	549	8	**2**	-	-	-	616	8	**2**
-55°	535	9	**2**	-	-	-	600	10	**2**
-60°	518	10	**2**	-	-	-	583	11	**2**
-65°	498	12	**2**	-	-	-	562	12	**2**
-70°	472	14	**2**	-	-	-	534	16	**2**
-75°	432	19	**2**	-	-	-	492	23	**2**
-80°	360	27	**2**	-	-	-	419	29	**2**
-85°	156	51	**2**	-	-	-	211	58	**2**

17. Spare parts

Use only original FRIEDRICH or other spare parts conforming to respective standards.

Ordering spare parts

Spare parts must be identified precisely using the operating instructions and the respective spare parts list prior to delivery in order to ensure supply of the correct spare parts. This will avoid unnecessary delays, incorrect deliveries and enquiries to FRIEDRICH Schwingtechnik.

The following must be stated when placing the delivery:

- The FRIEDRICH Schwingtechnik unbalance exciter type and number. Both of these are shown on the type plate.
- Description of the part from the spare parts list
- **Important!** Please do not forget to tell us the number or quantity of the spare parts ordered.